CLAIMS

What is Claimed is:

1. A method of redistributing power radiated by an antenna comprised of a plurality of antenna elements, the method comprising:

(a) performing an antenna directivity estimator function to screen out inappropriate antenna directivity profiles from a plurality of antenna directivity profiles, thereby determining one or more remaining, appropriate antenna directivity profiles; and

(b) performing an optimizer function on the remaining, appropriate antenna element directivities to determine a phase distribution for the antenna elements based on a desired power distribution for the antenna.

2. The method of claim 1, wherein the inappropriate antenna directivity profiles comprise impossible antenna directivity profiles.

3. The method of claim 2, wherein the antenna directivity estimator function is performed to screen out impossible antenna directivity profiles.

4. The method of claim 1, wherein the antenna directivity estimator function smoothes the antenna directivity profiles, while a total power for the antenna is conserved.

5. The method of claim 1, wherein each of the antenna directivity profiles is represented as a set of Point Set Array (PSA) points over a coverage area, and each of the PSA points is assigned a desired directivity.

6. The method of claim 5, wherein the antenna directivity estimator function:

adds extended points to the PSA points;

performs a superposition process on the PSA points using a basis function;

generates an achieved directivity for the PSA points following the superposition process;

generates a regional gain area product and a margin adjustment using the achieved directivity for the PSA points;

generates a predicated worst case margin using the regional gain area product and margin adjustment.

7. The method of claim 6, wherein the extended points have a 0 db directivity.

8. The method of claim 6, wherein the basis function comprises a curve chosen for the superposition process to transform the desired directivities to smooth the antenna directivity profile.

9. The method of claim 6, wherein the basis function comprises a pattern with all antenna elements having equal amplitude and equal phase.

10. The method of claim 6, wherein the desired directivity at each PSA point is a delta function, and each delta function is replaced by the basis function with a same height for the antenna directivity.

11. The method of claim 6, wherein the desired directivity at each PSA point is increased by a maximum directivity increment due to the superposition of surrounding PSA points according to:

$$\Delta D_i = \max_{n=1,N}^{n \neq i} [\Delta D_n]$$

wherein ΔD_i is a directivity increment of an ith PSA point due to superposition and ΔD_n is a directivity increment from an nth PSA point imposing on the ith PSA point .

12. The method of claim 6, wherein the antenna directivity estimator function calculates new directivities for the extended points after the superposition process.

13. The method of claim 1, further comprising readjusting the antenna directivities when the antenna directivity estimator function does not generate a positively adjusted margin.

14. The method of claim 1, wherein the optimizer function is performed within a specified time limit.

15. The method of claim 1, further comprising:

determining phases of the antenna elements based on the phase distribution; and

redistributing power to the antenna elements based on the determined phases.

16. An apparatus for redistributing power radiated by an antenna comprised of a plurality of antenna elements, comprising:

(a) means for performing an antenna directivity estimator function to screen out inappropriate antenna directivity profiles from a plurality of antenna directivity profiles, thereby determining one or more remaining, appropriate antenna directivity profiles; and

(b) means for performing an optimizer function on the remaining, appropriate antenna element directivities to determine a phase distribution for the antenna elements based on a desired power distribution for the antenna.

17. The apparatus of claim 16, wherein the inappropriate antenna directivity profiles comprise impossible antenna directivity profiles.

18. The apparatus of claim 17, wherein the antenna directivity estimator function is performed to screen out impossible antenna directivity profiles.

19. The apparatus of claim 16, wherein the antenna directivity estimator function smoothes the antenna directivity profiles, while a total power for the antenna is conserved.

20. The apparatus of claim 16, wherein each of the antenna directivity profiles is represented as a set of Point Set Array (PSA) points over a coverage area, and each of the PSA points is assigned a desired directivity.

21. The apparatus of claim 20, wherein the antenna directivity estimator function:

adds extended points to the PSA points;

performs a superposition process on the PSA points using a basis function;

generates an achieved directivity for the PSA points following the superposition process;

generates a regional gain area product and a margin adjustment using the achieved directivity for the PSA points;

generates a predicated worst case margin using the regional gain area product and margin adjustment.

22. The apparatus of claim 21, wherein the extended points have a 0 db directivity.

23. The apparatus of claim 21, wherein the basis function comprises a curve chosen for the superposition process to transform the desired directivities to smooth the antenna directivity profile.

24. The apparatus of claim 21, wherein the basis function comprises a pattern with all antenna elements having equal amplitude and equal phase.

25. The apparatus of claim 21, wherein the desired directivity at each PSA point is a delta function, and each delta function is replaced by the basis function with a same height for the antenna directivity.

26. The apparatus of claim 21, wherein the desired directivity at each PSA point is increased by a maximum directivity increment due to the superposition of surrounding PSA points according to:

$$\Delta D_i = \max_{n=1,N}^{n \neq i} [\Delta D_n]$$

wherein ΔD_i is a directivity increment of an ith PSA point due to superposition and ΔD_n is a directivity increment from an nth PSA point imposing on the ith PSA point .

27. The apparatus of claim 21, wherein the antenna directivity estimator function calculates new directivities for the extended points after the superposition process.

28. The apparatus of claim 16, further comprising means for readjusting the antenna directivities when the antenna directivity estimator function does not generate a positively adjusted margin.

29. The apparatus of claim 16, wherein the optimizer function is performed within a specified time limit.

30. The apparatus of claim 16, further comprising:

means for determining phases of the antenna elements based on the phase distribution; and

means for redistributing power to the antenna elements based on the determined phases.